Hoagland and his associates have been able to devise a suitable method of accurately estimating these substances in the blood of normal and pellagrous persons.

Progress in understanding the chemical nature and physiological action of vitamins and biocatalysts has made desirable an extension of studies of their function to diseases other than those caused by simple or mixed deficiencies. Since the function of vitamins and other essential catalysts are for the most part mediated through enzyme systems, certain diseases in which there is reason to suspect changes in the normal enzyme processes have been selected for study. Investigations were begun this year on pseudohypertrophic muscular dystrophy and muscular atrophy, a group of maladies in which interruption of normal muscle metabolism is apparent, and on advanced, non-malignant diseases of the liver such as cirrhosis, in which a marked depression of hepatic function is known to occur. Patients with these diseases have been admitted to the Hospital for study and some interesting facts have been ascertained. Their exact meaning requires further work.

PNEUMONIA AND OTHER RESPIRATORY DISEASES

Dr. Avery, Dr. Horsfall, and their Associates.

The outcome of any infectious disease is dependent upon the reaction between the infecting agent and the host. Factors in the host that influence this outcome are spoken of as susceptibility and resistance; those in the invading agent are collectively designated virulence. Drs. Avery and Horsfall and their associates have investigated the virulence of pneumococci, organisms that cause ordinary lobar pneumonia in human beings. These organisms are made up of a cell body surrounded by a capsule

or covering composed of complex sugars. It now appears that the manifest virulence of encapsulated pneumococci for a particular host species is dependent upon at least two distinct and separate properties of the bacterial cell. One factor seems to reside in the cell body and its influence is not demonstrable in the absence of a capsule. The other factor appears to be intimately associated with the capsule, if indeed it is not actually the capsule itself, and its influence is without effect in the absence of the cellular factor.

Dr. Goebel and his two associates have assisted Dr. Avery in investigating the complex sugars that surround or encapsulate pneumococci. To gain further information regarding the chemical nature of the pneumococcus cell, investigations have been carried on concerning an important constituent of the cell body spoken of as the "heterophile antigen." Dr. Goebel has shown that the antigen consists of a fatty substance and a complex sugar. This work has led Dr. Goebel directly into a war project for which he now has an OSRD contract. The problem has to do with the study of a complex substance obtained from dysentery bacilli which has a great deal to do with the toxicity of these organisms and which it is hoped will turn out to be a satisfactory immunizing agent if properly prepared. This substance is said to be a fat-sugar-protein complex.

The sulfa drugs are being used extensively for the treatment of pneumococcal pneumonia. There are certain substances in body tissues and fluids and in culture media which inhibit the action of these drugs. One of the substances is p-aminobenzoic acid which is active in amounts difficult to demonstrate by chemical means. Dr. Mirick has found a soil bacillus that produces an enzyme which facilitates studies on these inhibiting substances.

For several years a type of pneumonia, which is probably caused by a virus and spoken of as atypical pneumonia, has been recognized. This kind of pneumonia is becoming a problem in the armed forces. With the outbreak of the war Dr. Avery and Dr. Horsfall secured an OSRD contract for the investigation of atypical pneumonia. Since March of this year a major portion of their time has been devoted to the problem. Many patients sent to us from the Coast Guard and from the U. S. Naval Hospital in Brooklyn have been studied. Interesting observations have been made and it is hoped that something definite will come out of this work in the near future.

PHYSIOLOGY OF BACTERIA

Dr. Dubos and Associates.

Dr. Dubos, an agricultural bacteriologist, came to the Institute a number of years ago and worked with Dr. Avery for quite a while on the nature of the capsule of pneumococci. Dr. Dubos has always been interested in the physiology of bacteria and in the action of substances, such as enzymes, produced by them. As reported previously, Dr. Dubos discovered a soil bacillus that produces substances now spoken of as gramicidin and tyrocidin which have a lethal action on all Gram-positive bacteria. The assistance of Dr. Hotchkiss was obtained by Dr. Dubos in order to study the chemical nature of these two substances. During the past year this work has continued and at present the structures of these substances are fairly well known. In addition to this, a great deal has been learned concerning the effect that these substances have on the physiological activity of various bacteria.

During the year, because of the outbreak of the war, Dr. Dubos became more and more interested in toxic substances derived from Gram-